United States Joint Forces Command Joint Experimentation Directorate Joint Futures Lab

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National Joint Experimentation Environment

Why do we need simulations for joint experimentation?

Simulation is essential for joint experimentation, which by its nature is much more complicated than individual Service experimentation. Our nation cannot afford the number of live exercise iterations it would require to adequately refine and assess future joint concepts and to develop valid transformational recommendations. Simulation also offers an opportunity to thoroughly and rapidly explore the capabilities of future organizations, technologies and situations without actually creating them.

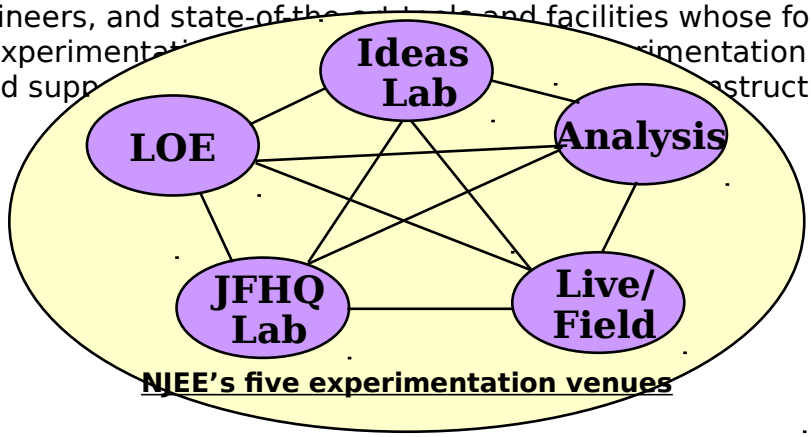
In 1999, the Government Accounting Office and the Defense Science Board published reports highlighting the lack of simulation tools to support joint experimentation. Since then, the Joint Experimentation Directorate has identified a cost-effective solution to evolve current simulation programs into a joint experimentation environment.

To make a credible and compelling case when experimentation findings challenge traditionally vested interests, credible high fidelity simulations must exist . This “higher fidelity” gives warfighters and national decision-makers more detailed insight into the complex interactions of future conflicts. This ability allows us to focus on causal relationships and to measure the contributions of doctrine, organizations and technologies with greater precision. It also provides a richer set of metrics for those quantitative assessments that are the basis of national security transformational change recommendations.

What should the National Joint Experimentation Environment be?

The experimentation environment should be a joint synthetic battlespace that seamlessly integrates those virtual and real-world systems needed to support joint experimentation. It should provide the flexibility to experiment with new doctrine, organizations, and/or materiel. Its virtual nature as created by simulation could be distributed almost anywhere. This would uniquely open up the possibility of continuous experimentation by a variety of Joint and Service users. This virtual environment could also be linked with training and testing ranges to support large-scale, live experimentation events.

The National Joint Experimentation Environment (NJEE) would consist of expert system architects and engineers, and state-of-the-art tools and facilities whose focus is to enhance and support joint experimentation environments, shown below, would support constructive actions.



NJEE’s five experimentation venues

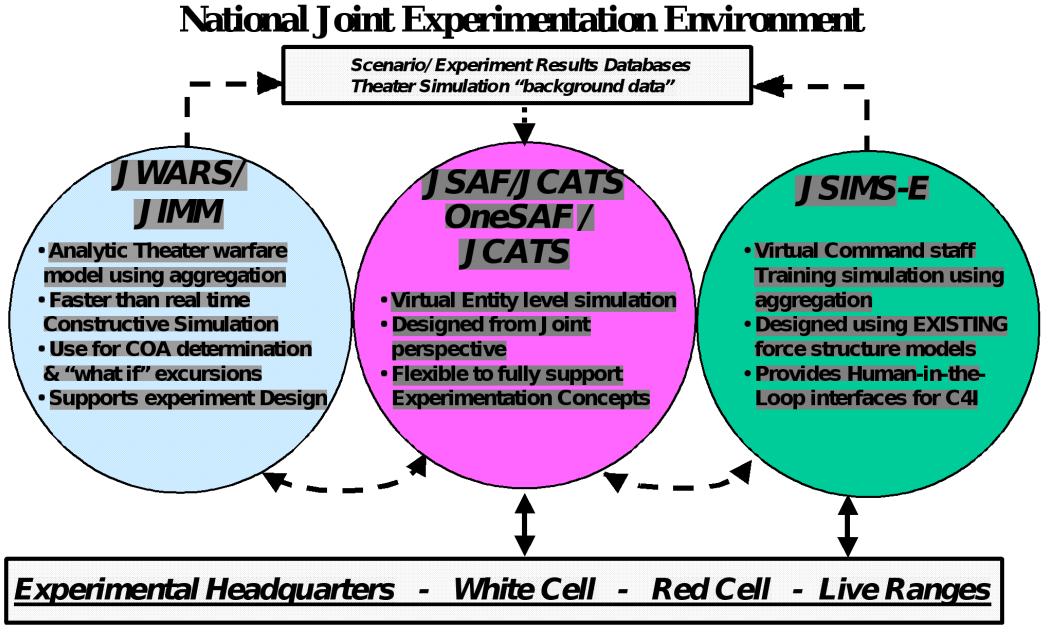
A number of differing venues within the NJEE, they share facilities, people, tools and data. The whole is stronger than the sum of the parts.

Fact sheet continued: *National Joint Experimentation Environment*

How would the NJEE environment be built?

The basic components for a *first-generation* capability exist today. The *Joint Semi-Automated Forces* (JSAF) simulation is unique today in its ability to support experimentation at the Joint level. It provides the backbone for a small-scale synthetic battlespace environment. The JSAF model can simulate up to 50,000 systems and give the experimenters a reasonably comprehensive understanding of the battlespace. While this may seem a large number, the future joint battlespace will be very crowded when civilians, unmanned and robotic systems are added to the equation.

The *second-generation* system will require an even more robust capability. Initially, it would need to simulate up to 100,000 systems to account for civilian ground, sea, and air traffic normally found in an operational area. Eventually we will surpass simulating one million systems. If funded, JSAF would meet this goal by migrating to a system of scaleable parallel processors. This capability has already been demonstrated in prototype. The system would be rounded out with the completion of the triad shown below. These elements are the constructive component, *Joint Warfare System* (JWARS) augmented with the *Joint Integrated Mission Model* (JIMM); the lower fidelity component, *Joint Simulation System* (JSIMS); and the high fidelity component, JSAF, augmented by the U.S. Army's *OneSAF and the Joint Conflict & Tactical Simulation (JCATS)*. This joint ment


National Joint Experimentation Environment
Scenario/ Experiment Results Databases
Theater Simulation "background data"
JWARS/ JIMM
• Analytic Theater warfare model using aggregation
• Faster than real time Constructive Simulation
• Use for COA determination & "what if" excursions
• Supports experiment Design
JSAF/JCATS OneSAF / JCATS
• Virtual Entity level simulation
• Designed from Joint perspective
• Flexible to fully support Experimentation Concepts
JSIMS-E
• Virtual Command staff Training simulation using aggregation
• Designed using EXISTING force structure models
• Provides Human-in-the-Loop interfaces for C4I
Experimental Headquarters - White Cell - Red Cell - Live Ranges

What are the benefits of this environment?

The inherent flexibility of this environment would allow us to rapidly shift timeframes; to perform near-continuous experimentation; to explore multiple venues simultaneously; to run locally or distribute globally; and, most importantly, to ensure coherent jointness is built in from the start.

The continuous experimentation environment would make it easier to coordinate and synchronize Service experimentation efforts and would facilitate leveraging activities among the participants. This would significantly reduce overall Department of Defense (DOD) experimentation costs.

Finally, this environment would provide a flexible family of simulations that would contain enhanced analytical tools to properly explore the operational concepts, organizational structures and technological innovations required to realize Joint Vision 2020, our

JWARS (Joint Warfare Simulation) / **JIMM** (Joint Integrated Mission Model)

- Analytic constructive simulations designed for joint theater warfare.
- Provides up to 1000:1 timescale to forecast battle outcome using aggregated entity model

JSAF (Joint Semi-Automated Forces)

- High level architecture based simulation using individual entity models
- Supports the modification of behavior and entity interaction
- Scaleable to meet needs of joint experimentation

JCATS (Joint Conflict & Tactical Simulation)

- Very high level fidelity entity-level
- Urban environment

JSIMS-E (Joint Simulation System-Experimental)

- Training simulation adopted for experimentation. Uses an aggregated entity model to simulate a theater of interactions. Includes player unit interfaces for human-in-the-loop training exercises using C4I equipment

G2 / Rethink / Organizational Sand